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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/782,745	02/19/2004	David J. Collodi	7871/17	1667

757 7590 02/15/2007

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EXAMINER	
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ART UNIT	PAPER NUMBER
2123	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/15/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/782,745	COLLODI, DAVID J.	
	Examiner	Art Unit	
	Russ Guill	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-52* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-52* is/are rejected.

7)☒ Claim(s) *10,25,34 and 45* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/12/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1 - 52 have been examined. Claims 1 - 52 have been rejected.

Claim Objections

2. Regarding claim 10, the claim is objected to for the following minor informalities: The claim appears to skip a step d.

3. Regarding claim 25, the claim is objected to for the following minor informalities: the claim recites in line 10, "the respective links". Reference to the previous limitation should remain consistent to avoid any possible confusion or antecedent issues.

4. Regarding claim 34, the claim is objected to for the following minor informalities: the claim recites in line 4, "providing set of equations". The phrase appears to mean, "providing a set of equations".

5. Regarding claim 45, the claim is objected to for the following minor informalities: the claim recites in lines 4 - 5, "logic operable to creating a nested grouping". The phrase appears to mean, "logic operable to create a nested grouping".

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

a. Claims 1 - 15, 18 - 44 and 48 - 52 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

i. Regarding claim 1, the claim recites in lines 7 and 12, "solving a solution for the physical dynamics". The meaning of "solving a solution" is unclear, since a solution is already solved. For the purpose of claim examination, the phrase "solving a solution for the physical dynamics" is interpreted as, "solving for the physical dynamics".

ii. Regarding claim 3, the claim recites in lines 1 - 2, "performing multiple iterative solutions". The meaning of the phrase is unclear, since a solution is not a process that can be performed. For the purpose of claim examination, the phrase "performing multiple iterative solutions" is interpreted as, "performing an iterative solution method multiple times".

iii. Regarding claim 8, the claim recites "the coefficient of friction". The phrase appears to have insufficient antecedent support. For the purpose of claim examination, the phrase is interpreted as, "a coefficient of friction".

iv. Regarding claim 10, the claim recites in lines 7 and 11, "solving a solution to the physical dynamics". The meaning of "solving a solution" is unclear, since a solution is already solved. For the purpose of claim examination, the phrase "solving a solution to the physical dynamics" is interpreted as, "solving for the physical dynamics".

v. Regarding claim 10, the claim recites in line 13, "the solution". The claim contains two preceding solutions, so it is unclear which solution is intended. For the purpose of claim examination, the phrase is interpreted as "the solution of step e".

vi. Regarding claim 12, the claim recites in lines 3 - 4, "solving a solution for the physical dynamics". The meaning of "solving a solution" is unclear, since a solution is already solved. For the purpose of claim examination, the phrase "solving a solution for the physical dynamics" is interpreted as, "solving for the physical dynamics".

vii. Regarding claim 14, the claim recites in line 14, "solving a solution for the physical dynamics". The meaning of "solving a solution" is unclear, since a solution is already solved. For the purpose of claim examination, the phrase "solving a solution for the physical dynamics" is interpreted as, "solving for the physical dynamics".

viii. Regarding claim 18, the claim recites in lines 1 - 2, "performing multiple iterative solutions". The meaning of the phrase is unclear, since a solution is not a process that can be performed. For the purpose of claim examination, the phrase "performing multiple iterative solutions" is interpreted as, "performing an iterative solution method multiple times".

ix. Regarding claim 23, the claim recites "the coefficient of friction". The phrase appears to have insufficient antecedent support. For the purpose of claim examination, the phrase is interpreted as, "a coefficient of friction".

x. Regarding claim 25, the claim recites in line 9, "solving a solution for the physical dynamics". The meaning of "solving a solution" is unclear, since a solution is already solved. For the purpose of claim examination, the phrase "solving a solution for the physical dynamics" is interpreted as, "solving for the physical dynamics".

xi. Regarding claim 30, the claim recites "the coefficient of friction". The phrase appears to have insufficient antecedent support. For the purpose of claim examination, the phrase is interpreted as, "a coefficient of friction".

xii. Regarding claim 33, the claim recites in lines 1 - 2, "performing multiple iterative solutions". The meaning of the phrase is unclear, since a solution is not a process that can be performed. For the purpose of claim examination, the phrase "performing multiple iterative solutions" is interpreted as, "performing an iterative solution method multiple times".

xiii. Regarding claim 34, the claim recites in line 5, "the set of the predetermined set of objects". The set of the predetermined set of objects appears to have insufficient antecedent basis. For the purpose of claim examination, the phrase, "the set of the predetermined set of objects" is interpreted as, "the predetermined set of objects".

xiv. Regarding claim 34, the claim recites in lines 10 - 11, "solving an iterative solution for the physical dynamics of the objects using the assigned weights". The meaning of "solving an iterative solution" is

unclear since a solution is already solved. For the purpose of claim examination, the phrase is interpreted as, "solving for the physical dynamics of the objects using the assigned weights using an iterative solution method".

xv. Regarding claim 34, the claim recites in lines 14 - 15, "solving an iterative solution for the physical dynamics of the objects using the adjusted weights". The meaning of "solving an iterative solution" is unclear since a solution is already solved. For the purpose of claim examination, the phrase is interpreted as, "solving for the physical dynamics of the objects using the adjusted weights using an iterative solution method".

xvi. Regarding claim 35, the claim recites, "the predetermined acceptable tolerance". The phrase appears to have insufficient antecedent basis. For the purpose of claim examination, the phrase is interpreted as, "a predetermined acceptable tolerance".

xvii. Regarding claim 39, the claim recites in line 5, "the set of the predetermined set of objects". The set of the predetermined set of objects appears to have insufficient antecedent basis. For the purpose of claim examination, the phrase, "the set of the predetermined set of objects" is interpreted as, "the predetermined set of objects".

xviii. Regarding claim 39, the claim recites in line 9, "the coefficient of friction". The phrase appears to have insufficient antecedent support. For

the purpose of claim examination, the phrase is interpreted as, "a coefficient of friction".

xix. Regarding claim 39, the claim recites in lines 12 - 13, "solving an iterative solution for the physical dynamics of the objects using the assigned weights". The meaning of "solving an iterative solution" is unclear since a solution is already solved. For the purpose of claim examination, the phrase is interpreted as, "solving for the physical dynamics of the objects using the assigned weights using an iterative solution method".

xx. Regarding claim 39, the claim recites in lines 16 - 17, "solving an iterative solution for the physical dynamics of the objects using the adjusted weights". The meaning of "solving an iterative solution" is unclear since a solution is already solved. For the purpose of claim examination, the phrase is interpreted as, "solving for the physical dynamics of the objects using the adjusted weights using an iterative solution method".

xxi. Regarding claim 40, the claim recites, "the predetermined acceptable tolerance". The phrase appears to have insufficient antecedent basis. For the purpose of claim examination, the phrase is interpreted as, "a predetermined acceptable tolerance".

xxii. Regarding claim 42, the claim recites, "the coefficient of friction". The phrase appears to have insufficient antecedent support. For the

purpose of claim examination, the phrase is interpreted as, "a coefficient of friction".

xxiii. Regarding claim 48, the claim recites, "the solution". The phrase appears to have insufficient antecedent support. For the purpose of claim examination, the phrase is interpreted as, "a solution".

xxiv. Regarding claim 49, the claim recites in line 2, "perform multiple iterative solutions". The meaning of the phrase is unclear, since a solution is not a process that can be performed. For the purpose of claim examination, the phrase "perform multiple iterative solutions" is interpreted as, "perform an iterative solution method multiple times".

xxv. Regarding claim 52, the claim recites, "the coefficient of friction". The phrase appears to have insufficient antecedent support. For the purpose of claim examination, the phrase is interpreted as, "a coefficient of friction".

xxvi. **Claims 2, 4 – 7, 9, 11, 13, 15, 19 – 22, 24, 26 – 29, 31 – 32, 36 – 38, 41, 43 – 44 and 50 - 51** are rejected based on their dependency on their respective intermediate and parent claims which are rejected under 35 U.S.C. 112, second paragraph.

Claim Rejections - 35 USC § 101

7. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

8. Claims 1 - 52 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

a. Regarding claim 1 and dependent claims, the recited method appears to contain abstract ideas such as solving for a solution for physical dynamics. Therefore, to be statutory, the claim must be directed to a practical application producing a concrete, useful and tangible result. The claim does not appear to produce a tangible result needed to support a practical application. The method appears to be directed to a judicial exception since the method appears to be a set of abstract ideas, but does not appear to have a practical application producing a concrete, useful and tangible result.

b. Regarding claim 10 and dependent claims, the recited method appears to contain abstract ideas such as solving for a solution for physical dynamics. Therefore, to be statutory, the claim must be directed to a practical application producing a concrete, useful and tangible result. The claim does not appear to produce a tangible result needed to support a practical application. The method appears to be directed to a judicial exception since the method appears to be a set of abstract ideas, but does not appear to have a practical application producing a concrete, useful and tangible result.

c. Regarding claim 16 and dependent claims, the recited method appears to contain abstract ideas such as solving for a solution for physical dynamics. Therefore, to be statutory, the claim must be directed to a practical application producing a concrete, useful and tangible result. The claim does not appear to produce a tangible result needed to support a practical application. The method

appears to be directed to a judicial exception since the method appears to be a set of abstract ideas, but does not appear to have a practical application producing a concrete, useful and tangible result.

d. Regarding claim 25 and dependent claims, the recited method appears to contain abstract ideas such as solving for a solution for physical dynamics. Therefore, to be statutory, the claim must be directed to a practical application producing a concrete, useful and tangible result. The claim does not appear to produce a tangible result needed to support a practical application. The method appears to be directed to a judicial exception since the method appears to be a set of abstract ideas, but does not appear to have a practical application producing a concrete, useful and tangible result.

e. Regarding claim 34 and dependent claims, the recited method appears to contain abstract ideas such as solving for physical dynamics using an iterative method. Therefore, to be statutory, the claim must be directed to a practical application producing a concrete, useful and tangible result. The claim does not appear to produce a tangible result needed to support a practical application. The method appears to be directed to a judicial exception since the method appears to be a set of abstract ideas, but does not appear to have a practical application producing a concrete, useful and tangible result.

f. Regarding claim 39 and dependent claims, the recited method appears to contain abstract ideas such as solving for physical dynamics using an iterative method. Therefore, to be statutory, the claim must be directed to a practical application producing a concrete, useful and tangible result. The claim does not appear to produce a tangible result needed to support a practical application. The method appears to be directed to a judicial exception since the method

appears to be a set of abstract ideas, but does not appear to have a practical application producing a concrete, useful and tangible result.

g. Regarding claim 45 and dependent claims, the recited system appears to be entirely software, which appears to be an abstract idea. Therefore, to be statutory, the claim must be directed to a practical application producing a concrete, useful and tangible result. The claims do not appear to produce a tangible result needed to support a practical application.

h. Regarding claim 45, the recited system appears to be entirely software, which appears to be an abstract idea. Therefore, to be statutory, the claim must be directed to a practical application producing a concrete, useful and tangible result. Since claim 45 does not appear to have a processor functionally integrated with the software, which would be needed to realize the functionality of the software, there does not appear to be any ability for the system of claim 45 to produce a tangible result.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. **Claims 1, 16, 25 and 45** are rejected under 35 U.S.C. 103(a) as being unpatentable over Fisette (P. Fisette and J.C. Samin; "Symbolic generation of large multibody system dynamic equations using a new semi-explicit Newton/Euler recursive scheme", 1996, Archive of Applied Mechanics, Volume 66, Number 3, pages 187 - 199) in view of Jalon (Javier Garcia De Jalon and Eduardo Bayo; "Kinematic and Dynamic Simulation of Multibody Systems: The Real-Time Challenge", 1993, Springer-Verlag, pages 271 - 325).

a. The art of Fisette is directed to dynamic equations of multibody systems (Title).

b. The art of Jalon is directed to simulation of multibody systems (Title).

c. The art of Fisette and the art of Jalon are analogous art because they are both concerned with simulation of multibody systems.

d. Regarding **claim 1**:

e. Fisette appears to teach:

f. a. grouping a first and a second object in the predetermined set of objects to define a first binary object (**page 193, figure 4, part b**).;

g. c. grouping a third object to the first binary object to define a second binary object, the third object having at least one link to the

first binary object, thereby defining a second set of links (**page 193, figure 4, part b**);

h. e. recursively grouping additional objects to create additional binary objects and solving for the physical dynamics of the additional binary objects (**page 193, figure 4, part b**).

i. Fisette does not explicitly teach:

j. b. solving a solution for the physical dynamics of the objects in the first binary object at a first set of links;

k. d. solving a solution for the physical dynamics of the objects in the second binary object at the second set of links;

l. Jalon appears to teach:

m. b. solving a solution for the physical dynamics of the objects in the first binary object at a first set of links (**pages 289 - 290, section 8.2.4**);

n. d. solving a solution for the physical dynamics of the objects in the second binary object at the second set of links (**pages 289 - 290, section 8.2.4**);

o. The motivation to use the art of Jalon with the art of Fisette would have been the benefit recited in Jalon that two of the most efficient formulations of dynamics are presented (**page 271, first and second paragraphs**), which would have been recognized by the ordinary artisan as saving time.

p. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Jalon with the art of Fisette to produce the invention of claim 1.

q. Regarding **claim 16**:

r. Fisette appears to teach:

s. a. grouping the objects in the predetermined set of objects into two binary objects to define a first binary object and a second binary object (**page 193, figure 4, part b**);

t. b. grouping the objects in the first binary object into a subgroup of binary objects to define a nested group of binary objects in the first binary object (**page 193, figure 4, part b**);

u. c. grouping the objects in the second binary object into a subgroup of binary objects to define a nested group of binary objects in the second-binary object (**page 193, figure 4, part b**);

v. Fisette does not explicitly teach:

w. d. starting with the most deeply nested binary object and proceeding outward, solving a solution for the physical dynamics of the objects in the binary objects at the respective links.

x. Jalon appears to teach:

y. d. starting with the most deeply nested binary object and proceeding outward, solving a solution for the physical dynamics of the objects in the binary objects at the respective links (**pages 289 - 290, section 8.2.4; it would have been obvious that a recursive solution would start with the most deeply nested binary object**);

z. The motivation to use the art of Jalon with the art of Fisette would have been the benefit recited in Jalon that two of the most efficient formulations of dynamics are presented (**page 271, first and second paragraphs**), which would have been recognized by the ordinary artisan as saving time.

aa. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Jalon with the art of Fisette to produce the invention of claim 16.

bb. Regarding **claim 25**:

cc. Fisette appears to teach:

dd. a. creating a nested grouping of a plurality of binary objects from the objects in the set, at least one binary object containing two or more links (**page 193, figure 4, part b**);

ee. Fisette does not explicitly teach:

ff. b. starting with the most deeply nested binary object and proceeding outward, solving a solution for the physical dynamics of the objects in the binary objects at the respective links.

gg. Jalon appears to teach:

hh. b. starting with the most deeply nested binary object and proceeding outward, solving a solution for the physical dynamics of the objects in the binary objects at the respective links (**pages 289 - 290, section 8.2.4; it would have been obvious that a recursive solution would start with the most deeply nested binary object**);

ii. The motivation to use the art of Jalon with the art of Fisette would have been the benefit recited in Jalon that two of the most efficient formulations of dynamics are presented (**page 271, first and second paragraphs**), which would have been recognized by the ordinary artisan as saving time.

jj. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Jalon with the art of Fisette to produce the invention of claim 25.

kk. Regarding **claim 45**:

ll. Fisette appears to teach:

mm. a. a binary division unit having logic operable to creating a nested grouping of a plurality of binary objects from the objects in the set (**page 193, figure 4, part b**);

nn. Fisette does not explicitly teach:

oo. b. a dynamics unit having logic operable to solve a set of physical dynamics equations.

pp. Jalon appears to teach:

qq. b. a dynamics unit having logic operable to solve a set of physical dynamics equations (**pages 289 - 290, section 8.2.4**);

rr. The motivation to use the art of Jalon with the art of Fisette would have been the benefit recited in Jalon that two of the most efficient formulations of dynamics are presented (**page 271, first and second paragraphs**), which would have been recognized by the ordinary artisan as saving time.

ss. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Jalon with the art of Fisette to produce the invention of claim 45.

12. **Claims 2 - 9, 17 - 24, 26 - 33** are rejected under 35 U.S.C. 103(a) as being unpatentable over Fisette as modified by Jalon as applied to claims **1, 16, 25 and 45** above, further in view of Baraff1994A (David Baraff; "Non-penetrating Rigid Body Simulation", 1994, Eurographics 1993 State of the Art Reports, pages 1 - 23).

a. Fisette as modified by Jalon teaches a method of simulating physical dynamics of a set of objects connected to each other by links as recited in claims **1, 16, 25 and 45** above.

b. Regarding **claim 2**:

c. Fisette does not specifically teach:

d. providing, for each link, one or more link weight values operable to constrain the solution.

e. Baraff1994A appears to teach:

f. providing, for each link, one or more link weight values operable to constrain the solution (**pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that a penalty value would have been provided for each link**).

g. Regarding **claim 3**:

h. Fisette does not specifically teach:

i. performing multiple iterative solutions where at least one link weight value is adjusted at each iteration.

j. Baraff1994A appears to teach:

k. performing multiple iterative solutions where at least one link weight value is adjusted at each iteration (**pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that the penalty method is iterative and a penalty value would have been adjusted at each iteration of a penalty solution**).

l. Regarding **claim 4**:

m. Fisette does not specifically teach:

n. the link weight values are adjusted to maintain a set of constraints on the links within a predetermined acceptable tolerance.

o. Baraff1994A appears to teach:

p. the link weight values are adjusted to maintain a set of constraints on the links within a predetermined acceptable tolerance (**pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that a penalty value would have been adjusted at each iteration of a penalty solution**).

q. Regarding **claim 5**:

r. Fisette does not specifically teach:

s. the set of constraints includes the following constraints: the objects cannot interpenetrate each other and no adhesive normal forces are applied at the links.

t. Baraff1994A appears to teach:

u. the set of constraints includes the following constraints: the objects cannot interpenetrate each other and no adhesive normal forces are applied at the links (**page 9, sections 4.0 and 4.1**).

v. Regarding **claim 6**:

w. Fisette does not specifically teach:

x. the predetermined acceptable tolerance includes a predetermined amount of interpenetration at a link.

y. Baraff1994A appears to teach:

z. the predetermined acceptable tolerance includes a predetermined amount of interpenetration at a link (**pages 13 - 15,section 4.2 The Penalty Method; it would have been obvious that the penalty method has a tolerance for interpenetration**).

aa. Regarding **claim 7**:

bb. Fisette does not specifically teach:

cc. the predetermined acceptable tolerance includes a predetermined amount of adhesive normal force at a link.

dd. Baraff1994A appears to teach:

ee. the predetermined acceptable tolerance includes a predetermined amount of adhesive normal force at a link (**page 17, section 5.3 Static Friction; it would have been obvious that static friction is a tolerance of adhesive force before dynamic slipping occurs**).

ff. Regarding **claim 8**:

gg. Fisette does not specifically teach:

hh. the set of constraints further includes the constraint that, at a respective link, either the relative lateral motion is zero or the friction force at the link is equal to the normal force times the coefficient of friction.

ii. Baraff1994A appears to teach:

jj. the set of constraints further includes the constraint that, at a respective link, either the relative lateral motion is zero or the friction force at the link is equal to the normal force times the coefficient of friction (**page 17, section 5.2 Dynamic friction conditions and section 5.3 Static Friction**).

kk. Regarding **claim 9**:

ll. Fisette does not specifically teach:

mm. the predetermined acceptable tolerance includes a predetermined difference between the friction force at a link and the normal force times the coefficient of friction.

nn. Baraff1994A appears to teach:

oo. the predetermined acceptable tolerance includes a predetermined difference between the friction force at a link and the normal force times the coefficient of friction (**page 17, section 5.3 Static Friction; it would have been obvious that the threshold of dynamic friction from slipping is a predetermined difference between the friction force at a link and the normal force times the coefficient of friction**).

pp. Regarding **claim 17**:

qq. Fisette does not specifically teach:

rr. providing, for each link, one or more link weight values operable to constrain the solution.

ss. Baraff1994A appears to teach:

tt. providing, for each link, one or more link weight values operable to constrain the solution (**pages 13 - 15, section 4.2 Penalty Method; it**

would have been obvious that a penalty value would have been provided for each link).

uu. Regarding **claim 18**:

vv. Fisette does not specifically teach:

ww. performing multiple iterative solutions where at least one link weight value is adjusted at each iteration.

xx. Baraff1994A appears to teach:

yy. performing multiple iterative solutions where at least one link weight value is adjusted at each iteration ((pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that a penalty value would have been adjusted at each iteration of a penalty solution).

zz. Regarding **claim 19**:

aaa. Fisette does not specifically teach:

bbb. the link weight values are adjusted to maintain a set of constraints on the links within a predetermined acceptable tolerance.

ccc. Baraff1994A appears to teach:

ddd. the link weight values are adjusted to maintain a set of constraints on the links within a predetermined acceptable tolerance (pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that a penalty value would have been adjusted at each iteration of a penalty solution).

eee. Regarding **claim 20**:

fff. Fisette does not specifically teach:

ggg. the set of constraints includes the following constraints: the objects cannot interpenetrate each other and no adhesive normal forces are applied at the links.

hhh. Baraff1994A appears to teach:

iii. the set of constraints includes the following constraints: the objects cannot interpenetrate each other and no adhesive normal forces are applied at the links (**page 9, sections 4.0 and 4.1**).

jjj. Regarding **claim 21**:

kkk. Fisete does not specifically teach:

lll. the predetermined acceptable tolerance includes a predetermined amount of interpenetration at a link.

mmm. Baraff1994A appears to teach:

nnn. the predetermined acceptable tolerance includes a predetermined amount of interpenetration at a link (**pages 13 - 15, section 4.2 The Penalty Method; it would have been obvious that the penalty method has a tolerance for interpenetration**).

ooo. Regarding **claim 22**:

ppp. Fisete does not specifically teach:

qqq. the predetermined acceptable tolerance includes a predetermined amount of adhesive normal force at a link.

rrr. Baraff1994A appears to teach:

sss. the predetermined acceptable tolerance includes a predetermined amount of adhesive normal force at a link (**page 17, section 5.3 Static Friction; it would have been obvious that static friction is a tolerance of adhesive force before dynamic slipping occurs**).

ttt. Regarding **claim 23**:

uuu. Fisete does not specifically teach:

vvv. the set of constraints further includes the constraint that, at a respective link, either the relative lateral motion is zero or the friction force at the link is equal to the normal force times the coefficient of friction.

www. Baraff1994A appears to teach:

xxx. the set of constraints further includes the constraint that, at a respective link, either the relative lateral motion is zero or the friction force at the link is equal to the normal force times the coefficient of friction (page 17, section 5.2 Dynamic friction conditions and section 5.3 Static Friction).

yyy. Regarding **claim 24**:

zzz. Fisette does not specifically teach:

aaaa. the predetermined acceptable tolerance includes a predetermined difference between the friction force at a link and the normal force times the coefficient of friction.

bbbb. Baraff1994A appears to teach:

cccc. the predetermined acceptable tolerance includes a predetermined difference between the friction force at a link and the normal force times the coefficient of friction (page 17, section 5.3 Static Friction; it would have been obvious that the threshold of dynamic friction from slipping is a predetermined difference between the friction force at a link and the normal force times the coefficient of friction).

dddd. Regarding **claim 26**:

eeee. Fisette does not specifically teach:

ffff. the solution maintains a set of constraints on the links within a predetermined acceptable tolerance.

gggg. Baraff1994A appears to teach:

hhhh. the solution maintains a set of constraints on the links within a predetermined acceptable tolerance (pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that a penalty value would have been adjusted at each iteration of a penalty solution).

iiii. Regarding **claim 27**:

jjjj. Fisette does not specifically teach:

kkkk. the set of constraints includes the following constraints: the objects cannot interpenetrate each other and no adhesive normal forces are applied at the links.

llll. Baraff1994A appears to teach:

mmmm. the set of constraints includes the following constraints: the objects cannot interpenetrate each other and no adhesive normal forces are applied at the links (**page 9, sections 4.0 and 4.1**).

nnnn. Regarding **claim 28**:

oooo. Fisette does not specifically teach:

pppp. the predetermined acceptable tolerance includes a predetermined amount of interpenetration at a link.

qqqq. Baraff1994A appears to teach:

rrrr. the predetermined acceptable tolerance includes a predetermined amount of interpenetration at a link (**pages 13 - 15,section 4.2 The Penalty Method; it would have been obvious that the penalty method has a tolerance for interpenetration**).

ssss. Regarding **claim 29**:

tttt. Fisette does not specifically teach:

uuuu. the predetermined acceptable tolerance includes a predetermined amount of adhesive normal force at a link.

vvvv. Baraff1994A appears to teach:

wwww. the predetermined acceptable tolerance includes a predetermined amount of adhesive normal force at a link (**page 17, section 5.3 Static Friction; it would have been obvious that static friction is a tolerance of adhesive force before dynamic slipping occurs**).

xxxx. Regarding **claim 30**:

yyyy. Fisette does not specifically teach:

zzzz. the set of constraints further includes the constraint that, at a respective link, either the relative lateral motion is zero or the friction force at the link is equal to the normal force times the coefficient of friction.

aaaaa. Baraff1994A appears to teach:

bbbbb. the set of constraints further includes the constraint that, at a respective link, either the relative lateral motion is zero or the friction force at the link is equal to the normal force times the coefficient of friction (**page 17, section 5.2 Dynamic friction conditions and section 5.3 Static Friction**).

ccccc. Regarding **claim 31**:

ddddd. Fisette does not specifically teach:

eeeee. the predetermined acceptable tolerance includes a predetermined difference between the friction force at a link and the normal force times the coefficient of friction.

fffff. Baraff1994A appears to teach:

ggggg. the predetermined acceptable tolerance includes a predetermined difference between the friction force at a link and the normal force times the coefficient of friction (**page 17, section 5.3 Static Friction; it would have been obvious that the threshold of dynamic friction from slipping is a predetermined difference between the friction force at a link and the normal force times the coefficient of friction**).

hhhhh. Regarding **claim 32**:

iiiii. Fisette does not specifically teach:

jjjjj. providing, for each link, one or more link weight values operable to constrain the solution.

kkkkk. Baraff1994A appears to teach:

lllll. providing, for each link, one or more link weight values operable to constrain the solution (**pages 13 - 15, section 4.2 Penalty Method;**

it would have been obvious that a penalty value would have been provided for each link).

mmmmm. Regarding **claim 33**:

nnnnn. Fisette does not specifically teach:

OOOOO.performing multiple iterative solutions where at least one link weight value is adjusted at each iteration.

ppppp. Baraff1994A appears to teach:

qqqqq. performing multiple iterative solutions where at least one link weight value is adjusted at each iteration (**pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that a penalty value would have been adjusted at each iteration of a penalty solution**).

13. **Claims 34 - 44** are rejected under 35 U.S.C. 103(a) as being unpatentable over Baraff1994A (David Baraff; "Non-penetrating Rigid Body Simulation", 1994, Eurographics 1993 State of the Art Reports, pages 1 - 23) in view of Baraff1993 (David Baraff; "Issues in Computing Contact Forces for Non-Penetrating Rigid Bodies", 1993, Algorithmica, Volume 10, pages 292 - 352).

a. The art of Baraff1994A is directed to rigid body simulation (Title).

b. The art of Baraff1993 is directed to rigid body simulation (Title).

c. The art of Baraff1994A and the art of Baraff1993 are analogous art because they are both directed to the art of rigid body simulation.

d. Regarding **claim 34**:

e. Baraff1994A appears to teach:

f. a. providing set of equations that when solved define a solution to the physical dynamics of the set of the predetermined set of objects (**pages 12 - 13, section 4.1.2**), the solution having the following

constraints: the objects cannot interpenetrate each other and no adhesive normal forces can be applied at the links, (**page 9, sections 4.0 and 4.1**);

g. b. assigning at least one link weight to each of the links in the predetermined set of objects (**pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that a separate penalty value would have been assigned for each link**);

h. d. adjusting the assigned link weights if the constraints are violated at a link (**pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that a separate penalty value would have been adjusted for each link if the constraints were violated at a link**);

i. Baraff1994A does not specifically teach:

j. c. solving an iterative solution for the physical dynamics of the objects using the assigned weights;

k. e. solving an iterative solution for the physical dynamics of the objects using the adjusted weights;

l. f. repeating steps d. and e. until a solution is within a predetermined acceptable tolerance.

m. Baraff1993 appears to teach:

n. c. solving an iterative solution for the physical dynamics of the objects using the assigned weights (**pages 345 - 347, Appendix B. Iterative Solution Methods for Static Friction**);

o. e. solving an iterative solution for the physical dynamics of the objects using the adjusted weights (**pages 345 - 347, Appendix B. Iterative Solution Methods for Static Friction**);

p. f. repeating steps d. and e. until a solution is within a predetermined acceptable tolerance (**pages 345 - 347, Appendix B. Iterative Solution Methods for Static Friction**).

q. The motivation to use the art of Baraff1993 with the art of Baraff1994A would have been the knowledge of the ordinary artisan that iterative solutions are

simple to apply, which would have been recognized as a benefit by the ordinary artisan.

r. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Baraff1993 with the art of Baraff1994A to produce the invention of claim 34.

s. Regarding **claim 35**:

t. Baraff1994A appears to teach:

u. the predetermined acceptable tolerance includes a predetermined amount of adhesive normal force at a link (**page 17, section 5.3 Static Friction; it would have been obvious that static friction is a tolerance of adhesive force before dynamic slipping occurs**).

v. Regarding **claim 36**:

w. Baraff1994A appears to teach:

x. the predetermined acceptable tolerance includes a predetermined amount of interpenetration between two objects at a link (**pages 13 - 15,section 4.2 The Penalty Method; it would have been obvious that the penalty method has a tolerance for interpenetration**).

y. Regarding **claim 37**:

z. Baraff1994A appears to teach:

aa. the weights are decreased for links where adhesive normal force is applied (**pages 13 - 15,section 4.2 The Penalty Method; it would have been obvious that the penalty method decreases weights where adhesive normal force is applied**).

bb. Regarding **claim 38**:

cc. Baraff1994A appears to teach:

dd. the weights are increased for links where interpenetration occurs (**pages 13 - 15, section 4.2 The Penalty Method; it would have been obvious that the penalty method increases weights where interpenetration occurs**).

ee. Regarding **claim 39**:

ff. Baraff1994A appears to teach:

gg. a. providing a set of equations that when solved define a solution to the physical dynamics of the set of the predetermined set of objects (**pages 12 - 13, section 4.1.2**), the solution having the following constraints: the objects cannot interpenetrate each other and no adhesive normal forces can be applied at the links (**page 9, sections 4.0 and 4.1**), and that, at a respective link, either the relative lateral velocity is zero, or the friction force is equal to the normal force at the link times the coefficient of friction (**page 17, sections 5.2 and 5.3**);

hh. b. assigning at least one link weight to each of the links in the predetermined set of objects (**pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that a separate penalty value would have been assigned for each link**);

ii. d. adjusting the link weights assigned to the links if the constraints are violated at a link (**pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that a separate penalty value would have been adjusted for each link if the constraints were violated at a link**);

jj. Baraff1994A does not specifically teach:

kk. c. solving an iterative solution for the physical dynamics of the objects using the assigned weights;

ll. e. solving an iterative solution for the physical dynamics of the objects using the adjusted weights; and

mm. f. repeating steps d. and e. until a solution is within a predetermined acceptable tolerance.

nn. Baraff1993 appears to teach:

oo. c. solving an iterative solution for the physical dynamics of the objects using the assigned weights (**pages 345 - 347, Appendix B. Iterative Solution Methods for Static Friction**);

pp. e. solving an iterative solution for the physical dynamics of the objects using the adjusted weights (**pages 345 - 347, Appendix B. Iterative Solution Methods for Static Friction**);

qq. f. repeating steps d. and e. until a solution is within a predetermined acceptable tolerance (**pages 345 - 347, Appendix B. Iterative Solution Methods for Static Friction**).

rr. The motivation to use the art of Baraff1993 with the art of Baraff1994A would have been the knowledge of the ordinary artisan that iterative solutions are simple to apply, which would have been recognized as a benefit by the ordinary artisan.

ss. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Baraff1993 with the art of Baraff1994A to produce the invention of claim 39.

tt. Regarding **claim 40**:

uu. Baraff1994A appears to teach:

vv. the predetermined acceptable tolerance includes a predetermined amount of adhesive normal force at a link (**page 17, section 5.3 Static Friction; it would have been obvious that static friction is a tolerance of adhesive force before dynamic slipping occurs**).

ww. Regarding **claim 41**:

xx. Baraff1994A appears to teach:

yy. the predetermined acceptable tolerance includes a predetermined amount of interpenetration between two objects at a link (**pages 13 - 15, section 4.2 The Penalty Method; it would have been obvious that the penalty method has a tolerance for interpenetration**).

zz. Regarding **claim 42**:

aaa. Baraff1994A appears to teach:

bbb. the predetermined acceptable tolerance includes a predetermined difference between the friction force at a link and the normal force times the coefficient of friction (**page 17, section 5.3 Static Friction; it would have been obvious that the threshold of dynamic friction from slipping is a predetermined difference between the friction force at a link and the normal force times the coefficient of friction**).

ccc. Regarding **claim 43**:

ddd. Baraff1994A appears to teach:

eee. the weights are decreased for links where adhesive normal force is applied (**pages 13 - 15, section 4.2 The Penalty Method; it would have been obvious that the penalty method decreases weights where adhesive normal force is applied**).

fff. Regarding **claim 44**:

ggg. Baraff1994A appears to teach:

hhh. the weights are increased for links where interpenetration occurs (**pages 13 - 15, section 4.2 The Penalty Method; it would have been obvious that the penalty method increases weights where interpenetration occurs**).

14. **Claim 10** is rejected under 35 U.S.C. 103(a) as being unpatentable over Son (Wookho Son; "Hybrid Dynamic Simulation of Rigid-Body Contact with Coulomb Friction", 2001, Proceedings of the 2001 IEEE International Conference on Robotics & Automation, pages 1376 - 1381) in view of Baraff1994A (David Baraff; "Non-penetrating Rigid Body Simulation", 1994, Eurographics 1993 State of the Art Reports, pages 1 - 23).

a. The art of Son is directed to rigid body simulation (Title).

b. The art of Baraff1994A is directed to rigid body simulation (Title).

c. The art of Baraff1994A and the art of Son are analogous art because they are both directed to the art of rigid body simulation.

d. Son appears to teach:

e. a. providing, for at least one object, a set of reaction values describing the motion of the object in response to applied forces **(pages 1378 - 1379, section 3.3 Complementarity Formulation of Time-Stepping; and page 1379, figure 2)**;

f. b. solving a solution to the physical dynamics of the set of objects using the reaction values **(pages 1378 - 1379, section 3.3 Complementarity Formulation of Time-Stepping; and page 1379, figure 2)**;

g. c. changing the reaction values for at least one object to provide a set of adjusted reaction values **(pages 1378 - 1379, section 3.3 Complementarity Formulation of Time-Stepping; and page 1379, figure 2)**;

h. e. solving a solution to the physical dynamics of the objects using the set of adjusted reaction values **(pages 1378 - 1379, section 3.3 Complementarity Formulation of Time-Stepping; and page 1379, figure 2)**; and

i. Son does not specifically teach:

j. f. repeating steps c and e until the solution is within a predetermined acceptable tolerance.

k. Baraff1994A appears to teach:

l. f. repeating steps c and e until the solution is within a predetermined acceptable tolerance (**pages 13 - 15, section 4.2 The Penalty Method**).

m. The motivation to use the art of Baraff1994A with the art of Son would have been the knowledge of the ordinary artisan that iterative solutions are simple to apply, which would have been recognized as a benefit by the ordinary artisan.

n. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Baraff1994A with the art of Son to produce the invention of claim 10.

15. **Claim 11** is rejected under 35 U.S.C. 103(a) as being unpatentable over Son as modified by Baraff1994A as applied to claim 10 above, further in view of Fisette.

a. Son as modified by Baraff1994A teaches a method of simulating physical dynamics of a set of objects connected to each other by a link as recited in claim 10 above.

b. Regarding **claim 11**:

c. Son does not specifically teach:

d. creating a nested grouping of a plurality of binary objects from the objects in the set.

e. Fisette appears to teach:

f. creating a nested grouping of a plurality of binary objects from the objects in the set (**page 193, figure 4, part b a binary tree multibody**).

g. The motivation to use the art of Fisette with the art of Son as modified by Baraff1994A would have been the benefit recited in Fisette that a multibody system can be efficiently modeled (**page 187, Summary**), which would have been recognized as a benefit by the ordinary artisan.

h. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Fisette with the art of Son as modified by Baraff1994A to produce the invention of claim 11.

16. **Claims 12 - 15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Son as modified by Baraff1994A and Fisette as applied to claim 11 above, further in view of Jalon.

a. Son as modified by Baraff1994A and Fisette teaches a method of simulating physical dynamics of a set of objects connected to each other by a link as recited in claim 11 above.

b. Regarding **claim 12**:

c. Son does not explicitly teach:

d. b. starting with the most deeply nested binary object and proceeding outward, solving a solution for the physical dynamics of the objects in the binary objects at the respective links.

e. Jalon appears to teach:

f. b. starting with the most deeply nested binary object and proceeding outward, solving a solution for the physical dynamics of the objects in the binary objects at the respective links (**pages 289 - 290, section 8.2.4; it would have been obvious that a recursive solution would start with the most deeply nested binary object**);

g. The motivation to use the art of Jalon with the art of Son as modified by Baraff1994A and Fisette would have been the benefit recited in Jalon that two of the most efficient formulations of dynamics are presented (**page 271, first and second paragraphs**), which would have been recognized by the ordinary artisan as saving time.

h. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Jalon with the art of Son as modified by Baraff1994A and Fisette to produce the invention of claim 12.

i. Regarding **claim 13**:

j. Fisette does not specifically teach:

k. providing, for each link, one or more link weight values operable to constrain the solution.

l. Baraff1994A appears to teach:

m. providing, for each link, one or more link weight values operable to constrain the solution (**pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that a penalty value would have been provided for each link**).

n. Regarding **claim 14**:

o. Fisette does not specifically teach:

p. Adjusting at least one link weight value.

q. Baraff1994A appears to teach:

r. Adjusting at least one link weight value (**pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that the penalty method is iterative and a penalty value would have been adjusted at each iteration of a penalty solution**).

s. Regarding **claim 15**:

t. Fisette does not specifically teach:

u. the link weight values are adjusted to maintain a set of constraints on the links within a predetermined acceptable tolerance.

v. Baraff1994A appears to teach:

w. the link weight values are adjusted to maintain a set of constraints on the links within a predetermined acceptable tolerance (**pages 13 -**

15, section 4.2 Penalty Method; it would have been obvious that a penalty value would have been adjusted at each iteration of a penalty solution).

17. **Claims 46 - 47** are rejected under 35 U.S.C. 103(a) as being unpatentable over Fisette as modified by Jalon as applied to claims **1, 16, 25 and 45** above, further in view of Cuadrado (J. Cuadrado et al.; "Intelligent Simulation of Multibody Dynamics: Space-State and Descriptor Methods in Sequential and Parallel Computing Environments", 2000, Multibody System Dynamics, Volume 4, Number 1, pages 55 - 73).

a. Fisette as modified by Jalon teaches a method of simulating physical dynamics of a set of objects connected to each other by links as recited in claims **1, 16, 25 and 45** above.

b. Regarding **claim 46**:

c. Fisette does not specifically teach:

d. the dynamics unit comprises a set of multiple processors, each processor operable to solve a set of physical dynamics equations.

e. Cuadrado appears to teach:

f. the dynamics unit comprises a set of multiple processors, each processor operable to solve a set of physical dynamics equations (page 68, section 4.3 Results on Parallel Machines).

g. The motivation to use the art of Cuadrado with the art of Fisette as modified by Jalon would have been the benefit recited in Cuadrado that the method reduces CPU time up to 30% (**page 68, section 4.3 Results on Parallel Machines**).

h. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Cuadrado with the art of Fisette as modified by Jalon to produce the invention of claim 46.

i. Regarding **claim 47**:

j. Fisette does not specifically teach:

k. said multiple processors are used to solve the dynamics equations of multiple binary objects in parallel.

l. Cuadrado appears to teach:

m. said multiple processors are used to solve the dynamics equations of multiple binary objects in parallel (**page 68, section 4.3 Results on Parallel Machines**).

18. **Claims 48 - 52** are rejected under 35 U.S.C. 103(a) as being unpatentable over Fisette as modified by Jalon and Cuadrado as applied to claims 46 - 47 above, further in view of Baraff1994A (David Baraff; "Non-penetrating Rigid Body Simulation", 1994, Eurographics 1993 State of the Art Reports, pages 1 - 23).

a. Fisette as modified by Jalon and Cuadrado teaches a method of simulating physical dynamics of a set of objects connected to each other by links as recited in claims 46 - 47 above.

b. Regarding **claim 48**:

c. Fisette does not specifically teach:

d. each link includes one or more link weight values operable to constrain the solution.

e. Baraff1994A appears to teach:

f. each link includes one or more link weight values operable to constrain the solution (**pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that a penalty value would have been provided for each link**).

g. The motivation to use the art of Baraff1994A with Fisette as modified by Jalon and Cuadrado would have been the knowledge of the ordinary artisan that

iterative solutions are simple to apply, which would have been recognized as a benefit by the ordinary artisan.

h. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Baraff1994A with Fisette as modified by Jalon and Cuadrado to produce the invention of claim 48.

i. Regarding **claim 49**:

j. Fisette does not specifically teach:

k. performing multiple iterative solutions where at least one link weight value is adjusted at each iteration.

l. Baraff1994A appears to teach:

m. performing multiple iterative solutions where at least one link weight value is adjusted at each iteration (**pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that the penalty method is iterative and a penalty value would have been adjusted at each iteration of a penalty solution**).

n. Regarding **claim 50**:

o. Fisette does not specifically teach:

p. the link weight values are adjusted to maintain a set of constraints for each link within a predetermined tolerance.

q. Baraff1994A appears to teach:

r. the link weight values are adjusted to maintain a set of constraints for each link within a predetermined tolerance (**pages 13 - 15, section 4.2 Penalty Method; it would have been obvious that a penalty value would have been adjusted at each iteration of a penalty solution**).

s. Regarding **claim 51**:

t. Fisette does not specifically teach:

u. the set of constraints includes the following constraints: the objects cannot interpenetrate each other and no adhesive normal force is applied.

v. Baraff1994A appears to teach:

w. the set of constraints includes the following constraints: the objects cannot interpenetrate each other and no adhesive normal force is applied (**page 9, sections 4.0 and 4.1**).

x. Regarding **claim 52**:

y. Fisette does not specifically teach:

z. the set of constraints further includes the constraint that, at a respective link, either the relative lateral motion is zero or the friction force at the link is equal to the normal force times the coefficient of friction.

aa. Baraff1994A appears to teach:

bb. the set of constraints further includes the constraint that, at a respective link, either the relative lateral motion is zero or the friction force at the link is equal to the normal force multiplied by the coefficient of friction (**page 17, section 5.2 Dynamic friction conditions and section 5.3 Static Friction**).

19. **Examiner's Note:** Examiner has cited particular columns and line numbers in the references applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings of the art and are applied to specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the Applicant in preparing responses, to fully consider the references in their entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner. The entire reference is considered to provide disclosure relating to the claimed invention.

Conclusion

20. The prior art made of record and not relied upon is considered pertinent to the applicant's disclosure:

a. J.P.A. Bastos et al.; "A Variable Local Relaxation Technique in Non-linear Problems", 1995, IEEE Transactions on Magnetics, Volume 31, Number 3; teaches using a different acceleration parameter for convergence in the solution of non-linear equations.

21. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Russ Guill whose telephone number is 571-272-7955. The examiner can normally be reached on Monday - Friday 9:30 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached on 571-272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Any inquiry of a general nature or relating to the status of this application should be directed to the TC2100 Group Receptionist: 571-272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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1/26/07

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